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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

DENDROLOGY
FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
GRAZING RESEARCH

September, 1927.

GOVERNMENT PRINTING OFFICE 11937

BRANCH OF RESEARCH

September, 1927

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FOREST EXPERIMENT STATIONS

Washington

General

Word has been received from Haig that he is safely established at 79 Beers St., New Haven, Conn. For the next few weeks, at least, he will be in the field a large part of the time. He has selected a soils problem which is to be worked out in cooperation with the Connecticut Agricultural Experiment Station.

Before leaving for Yale, Haig completed the computations on the western white pine yield study. As an interesting sidelight, he found, after a very careful check, no indication of a correlation between composition and yield. There was a tendency, however, to find higher yields where there was a high percentage of white pine present. Site automatically takes care of this factor as the percentage of white pine seems to increase with the change of site from poor to good.

The technic evolved in this study will be of great help when yield studies of mixed pine in California and oaks in the East are undertaken.

A small edition of the western white pine volume and yield tables will be mimeographed.

Press notices are already out announcing the selection of Dr. John S. Boyce, Forest Pathologist of the Bureau of Plant Industry, as the successor to S. T. Dana as Director of the Northeastern Forest Experiment Station. Mr. Dana is now established as Dean of the new Michigan School of Forestry and Conservation at Ann Arbor. Dr. Boyce will remain in the Pacific Northwest until after the first of the year in order to finish up important projects on which he is now engaged.

Library

During the month of September 799 books and periodicals were loaned from the library, and 127 members of the Service and others consulted the library in person.

There were 113 books and articles indexed for the catalogue in September.

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(Over)

CENTRAL STATES FOREST EXPERIMENT STATION

General

The Station is now well established in excellent quarters provided by the Ohio State University. It is located in the southeast section of the Horticultural and Forestry Building in four office rooms very conveniently arranged. This space will undoubtedly take care of the needs of the Station for the current year or until some further expansion of its staff.

The Station staff was increased during the month by the addition of Dr. Bernard F. Meyer, Associate Forest Ecologist, who reported for work on September 15th. Dr. Meyer made a trip through the northeastern forest during a short vacation following the closing of his work with the University. The temporary appointment of Miss Virginia Eader having expired, the Station has been fortunate in securing Mrs. Grace P. Bonner.

Flood Study

Work on the flood study took the time of part of the staff during the month of September. In accordance with the request of Mr. Sherman an attempt was made to map the actual forest areas in so far as this information could be obtained. Some sections of the Ohio valley were found to have been well covered by geographical survey topographic sheets with forest overprint, but in the main these are lacking. Outside of the State of Illinois no very complete record of actual forest cover is available except that mapped as over-print on the topographic sheets. The flood study has at least shown the need for more specific information in regard to forest cover and its influence on run-off and erosion. The report has now been forwarded to Washington.

In the process of compiling this report, a general survey of the geological and soils conditions in the Ohio Basin was made. This material was compiled from various reports by Dr. Hursh of the Appalachian Forest Experiment Station. A summary of climatic conditions affecting the flood situation was secured largely from Bulletin W of the Weather Bureau. No attempt was made to incorporate information other than that shown in this Bulletin in its records of precipitation and temperature. Summary records of stream flow were secured from Water Supply Papers and District Hydraulic Engineers. A summary statement of waterpower development was also secured from the Executive Secretary of the Federal Power Commission.

Information relative to forest cover was secured from various state sources and by field examination on the part of the men directly engaged in making up the report as well as from records published in the 1925 Census Report. The state and regional maps showing the distribution of forest cover by per cent classes was prepared from this material.

Oak Study

The study of growth and yield in even-aged stands of oak has been extended to include territory in the Ohio valley and north into Pennsylvania. Through the cooperation of the Allegheny Forest Experiment Station a party of three men has been engaged in finding and measuring oak stands in Pennsylvania.

This party reports that second growth stands which resulted from charcoaling in Pennsylvania are largely unsuitable for this study because of interference with the stocking through cutting, fire and the mixture of other species with oak. In some instances, also, chestnut blight has killed the chestnut and this has since been removed, so that even where it occupies a small percentage of the stand it is difficult to obtain satisfactory yield measurements.

A party under the direction of Hanley is also working in southeastern Ohio carrying on measurements in second growth oak. The oak stands in Ohio are freer from other species but have in many instances been cut over for mine timbers. While protected from fire in recent years, these stands show former damage by fire.

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LAKE STATES FOREST EXPERIMENT STATION

Eight permanent sample plots were laid out on the Minnesota National Forest, one set of 4 plots in a 50-year-old mixed Norway and jack pine stand to determine the effect of removal of the jack pine, which is already mature, and some of the Norway pine upon the growth of the remaining stand, and another set of 4 plots in a 23-year-old stand of pure Norway pine to test the effect of different degrees of thinning. Vegetation surveys were made on all other plots on the Minnesota National Forest; stakes were set and arrangements for signs made. All of the older plots are now mapped. Soil samples from each plot are still to be obtained, and these will be used during the winter in the greenhouse here for testing their physical properties and also for determining the growth upon them of various species.

At Ruse, preparation for this fall's cutting was made. This year's cutting plan provides for clear cutting 5 acres, cutting 5 acres to a 12-inch diameter limit, and cutting 10 acres selectively for the best silvicultural effect, irrespective of the size of the trees to be cut. Disposal of slash by piling and burning is also to be tried on portions of the two 5-acre plots. The actual logging is to start early in October.

The advance report on Selective Logging, by Zon and Garver, has reached the page proof stage and should be ready for distribution in a few days. The report occupies 23 pages, and is printed in 5500 copies, of which 1000 copies are retained by the Northern Hemlock and Hardwood Manufacturers' Association and 4500 copies turned over to the Forest Service for its own distribution.

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APPALACHIAN FOREST EXPERIMENT STATION

The majority of the staff was busy in the field during September, on studies of chestnut replacement and the natural reproduction of hardwoods after cutting.

During a visit from Dr. F. C. Craighead relative to the forest insect investigations, Frothingham discussed with him and J. A. Beal the proposed plans for the development of the experimental forest at Bent Creek. Frothingham also had conferences with assistant District Forester C. G. Smith, relative to the District 7 tax study, and with Colonel Joseph Hyde Pratt and Verne Rhoades, as to Appalachian Forest Research Council activities. A meeting of the Council will be held at Asheville October 17.

Mr. W. P. Lemman, of the American Forest Products Company, visited the Station to discuss problems of chestnut utilization. Other visitors were E. D. Burchard, geologist of the North Carolina Department of Conservation and Development; W. K. Beichler, until recently technical assistant on the Pisgah National Forest, and now North Carolina State District Forester with headquarters at Asheville; and John D. Rue, who arrived from Madison, Wis., toward the end of the month to take up his new duties in charge of the research activities of the Champion Fibre Company, of Canton, N. C. The Station feels fortunate in having a man of Mr. Rue's interests and capacities so near at hand.

Following the meeting of the North Carolina Forestry Association, at High Point, N. C., Mr. Reuben Robertson, President of the Champion Fibre Company, entertained a number of foresters and

lumbermen at a dinner in honor of Dr. Axel Oxholm, at the Biltmore Forest Country Club. Dr. Oxholm gave a brief but very interesting account of the work of the National Committee on Wood Utilization, of which he is director.

Haasis and Sims left during the month to continue their courses at Johns Hopkins University and the University of Michigan, respectively. Field assistant E. J. Downey left Buell's party on September 30, to accept a position with the Long-Bell Lumber Company at Shreveport, La.

Methods of Cutting - Mountain Hardwoods

Field work on the extensive phase of the study of natural reproduction in cut-over hardwood forests was brought to a close on September 16. The party, with Buell in charge, has been in the field since the latter part of June and has examined thirteen cutover areas, aggregating about 2000 acres, on the Unaka, Natural Bridge and Shenandoah National Forests.

The areas studied in September are on the North River and Lost River Districts of the Shenandoah Forest. Here cuttings made primarily for chestnut oak bark were encountered. Chestnut oak in this region forms stands in mixture with a small amount of northern red oak that typically occupy high, dry slopes which produce rather sparse and scrubby trees such as were avoided by lumbermen in the other regions visited by the party earlier in the summer. In the remoter sections the utilization of the chestnut oak logs is poor. On one area practically all the felled trees were peeled and allowed to lie in the woods.

Reproduction on these chestnut oak cuttings is abundant. The areas studied have not been burned within the last fifteen or twenty years, and the new growth that has come in since strict fire control has been enforced, (Shenandoah National Forest staff please take notice), proves that even such poor sites are capable of producing stands of real product value in addition to their obvious worth as watershed protectors.

While the permanent sample plots established in the Bent Creek experimental forest near Asheville this summer are for the immediate purpose of the chestnut replacement project, they will be equally productive for the study of reproduction following cutting. These plots were established under the general direction of Korstian, by MacKinney, assisted by Nothstein and Ziegler. Haasis recovered sufficiently from his appendicitis operation to make a series of photographs on the plots during the first part of September.

Haasis, Nothstein, and Ziegler left Asheville on the 10th for the camp of Buell's party on North Mountain, Shenandoah National Forest. This is in the area of the Station's proposed branch station at Edinburg, Va. This party, later assisted by Korstian, MacKinney, and Buell's party, made a record of the reproduction on quadrats in the plots established near Liberty Furnace in 1924, took photographs, and did other necessary work on the plots. Records were also made of the reproduction on a plot established by Haasis, in 1923, on Hone Quarry Run, in the grazing damage study. The reproduction which has come in on this plot is of such interest from the point of view of the study of natural reproduction following cutting that a strong recommendation was made for the maintenance of the plot under the methods of cutting project.

An additional permanent plot of one acre was established as plot 7 of the Liberty Furnace series. This plot is in a stand of hardwoods recently thinned under Forest Service marking, and is for the purpose of studying the results of this marking as to the future growth and development of the stand. Still another plot of the same series (plot 8) was staked out on a Forest Service sale area on the northern slope of North Mountain, in West Virginia. The area was cut over for chestnut oak seven years ago and now bears a scattered stand mainly of chestnut oak and red oak, in which considerable reproduction of these species and red maple is appearing.

Chestnut Replacement Studies

After the completion of the permanent plots at Bent Creek this study was continued in Virginia by Korstian and MacKinney. Enroute to the Shenandoah National Forest they met Gill and Clapper of the office of Forest Pathology, Bureau of Plant Industry, at Mons, Va., where they looked over the areas which have been under observation by the Office of Forest Pathology. This locality, in which chestnut originally made up sixty to ninety per cent of the stand, is considered quite representative of areas running heavily to chestnut and would be a desirable location for chestnut replacement plots.

At the Liberty Furnace center a chestnut replacement plot was located in a stand containing a relatively high percentage of chestnut when it was cut over about seven years ago. MacKinney, with the help of the field party, completed the records for this plot during the latter part of the month.

Forest Insect Investigation

Dr. F. C. Craighead spent the first ten days of September at the Bent Creek Laboratory near Asheville, N. C., conferring with Beal, St. George, and Balch on the progress of the studies on the southern pine beetle, which are being conducted in that section of the Pisgah National Forest.

On September 9th, St. George returned to the Eastern Field Station at East Falls Church, Va., going by way of High Point and Greensboro, N. C., where a considerable number of hickories have been reported as dying. An examination of the trees showed them to be heavily infested with the hickory bark beetle, Eccoptogaster quadrispinosus. Many outbreaks of this hickory bark beetle have occurred in the western part of the state during the summer.

R. E. Balch, field assistant, left Asheville on September 15th to continue his entomological studies under Dr. M. W. Blackman, at the New York State College of Forestry.

Seeding and Planting Studies.

Korstian and MacKinney examined the poplar seed spots in the Bent Creek experimental forest near Asheville. Although these seed spots showed much rodent damage early in the season, they have an average of two to three seedlings per spot. The seedlings are so small, however, that it is problematical whether they will survive the winter. The results to date cast considerable doubt as to seed spotting compared with the planting of one-year old nursery grown seedlings as the most effective method of artificially reproducing yellow poplar.

Korstian and MacKinney spent a half day at Canton looking over the Champion Fibre Company's nursery and plantations, accompanied by Mr. Damtoft, the company's forester.

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ALLEGHENY FOREST EXPERIMENT STATION

Junior Forester A. F. Hough joined the staff on September 7, after returning from a fruitful summer in the forests of Europe. Junior Forester Wood completed his assignment to the flood control study, on which he had been working under the direction of Director McCarthy of the Central States Station. He left soon after for the field on the study of rate of growth of oaks, again under the direction of McCarthy. With the aid of Hough and Field Assistant Morey of the Central States Station he has been studying areas cut clear for charcoal in connection with the early iron industry in Pennsylvania and Maryland, many of which have come back to good second growth.

Field Assistant Kirkham finished his summer work with the station, which was entirely under the direction of Mr. McIntyre of Penn State. He returned to St. Paul for the completion of his forestry course the coming spring.

Decision as to the headquarters of the station has been delayed by a long succession of events, and is yet to be made final. Except for a few days spent in expediting the headquarters matter so far as possible, Forbes devoted his entire time to the completion of the timber growing bulletin for the Southern pine region. The manuscript went to the Forester on September 27, and is now in the hands of the Board of Review.

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SOUTHERN FOREST EXPERIMENT STATION

General

Plans were started for the annual meeting of the Advisory Council which is scheduled to be held in New Orleans, October 29. In this connection, forms for reporting on forest experiment work were sent out to all agencies throughout the South who may be carrying on research work in forestry. The answers to these will be compiled by the Committee on Coordination of Research.

The question of moving our offices from the present location came up again and Demmon prepared a report on the space and location requirements deemed necessary for the efficient conduct of our work.

Professor R. W. Hayes of Louisiana State University completed his temporary assignment at our Station about the middle of the month when he left to resume his teaching work at Baton Rouge. His contacts with the Station during this seven weeks assignment have proved very profitable to all concerned. By having Professor Hayes' assistance at this time we have been able to complete certain field work in connection with the McNeill grazing experiment and the 200-acre tract at Bogalusa that must otherwise have been postponed.

Gemmer spent a week in New Orleans conferring on his program of work for the coming field season, which he had already discussed with Forest Supervisor Shaw on the ground. Gemmer's visit not only offered an opportunity for him to keep in touch with Station developments but allowed him to review with Barrett the report on the Urania thinning plots.

Protection, Fire

In connection with other work, Demmon, Wahlenberg, and Hayes burned over the summer longleaf fire plot at McNeill. Fortunately,

weather conditions for obtaining a good burn were ideal. A heavy rain which fell about two hours later would have necessitated postponing the burn for several days.

Barrett was less fortunate in an attempt to burn the Texas shortleaf plots. After nearly six weeks of general drought, a local shower the day before he arrived prevented him from making the regular summer burn. Similar difficulties have been experienced several times in the past, which can only be overcome by handling such work from branch stations.

Management

Wahlenberg spent two days with Hayes in completing tree descriptions, increment borings, and cone counts on the 200-acre tract at Bogalusa. During a day or two at headquarters, Hayes made good progress in completing ring counts on the increment cores taken at Bogalusa.

Measurements

In connection with the thinning plots at Urania, Barrett spent considerable time in the computation of rough cordwood volumes. Redrafting of height curves and recomputation of some of the earlier volume figures was found necessary. It was also necessary to make up new alinement charts for loblolly based on the new tables.

The preliminary volume and yield tables for second year southern pines were finally mimeographed and distributed only to those who will have definite use for them at the present time.

Naval Stores

At Starke Wyman reports that during the month all three experimental tracts of timber were dipped, and that twenty-eight streaks had been placed on all trees by September 30. Two more weeks work will complete the chipping season which is to be shortened this year because of the large amount of office work on hand.

Daily weighing of gum in the ecological study was discontinued early in the month because of lack of help. A new set of trees for this study will be laid out in October to take the place of the ones which have now been worked for seventeen months. The continuous working of these trees has lowered their vitality and reduced the yield to a point where records obtained this year under certain weather conditions are not at all comparable with those which were obtained a year ago under similar conditions.

The season has been very dry and hot. Jacksonville has had a shortage of about twenty-four inches of rain during 1927 up to the end of this month. September, which normally has a rainfall of over eight inches, was exceptionally dry, only two or three rainy days occurring during the month.

On the last day of the month the permanent staff of the Starke branch station was completed by the arrival of Mr. Lonie D. Vining who has been assigned to the newly created position of Superintendent of Field Station.

Forestation

Wakeley reviewed Wahlenberg's report on fertilizers and checked over Hayes' report on the plantations of the Great Southern Lumber Company, practically completing that study.

Longleaf cones containing insects were received from the Industrial Lumber Company at Elizabeth, Louisiana, and these have been forwarded to the Bureau of Entomology for identification.

Protection, Others

Grazing. The original wooden stakes used in the grazing experiment at McNeill have proved unsatisfactory, being too small to locate readily, and many have rotted off at the base or have been destroyed by fire. It was therefore decided to mark each of the 55 quadrats with 2 small iron fence posts as corner markers.

Wahlenberg tested the use of Dr. Pessin's new form for field notes and maps. He also made numerous minor changes in Pessin's revision of Hadley's report and the manuscript was submitted to Washington for publication.

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CALIFORNIA FOREST EXPERIMENT STATION

Management

The major management activity for the month was a white fir thinning study conducted on the Lassen Forest, in an overaged pine stand about sixty-five years old.

Four plots have been established. Plot 1 was thinned from below, leaving dominant and codominants; plot 2 was thinned from above, practically a commercial thinning cut to a diameter limit; plot 3 was thinned from below but much heavier than plot 1, emphasis being placed on equal spacing of the remaining trees; plot 4 was left untouched as the control plot.

Summary

Plot No.	Area	Original (per acre)		Remaining (per acre)	
		No. trees	No. dom.	Total trees	Dominant
1	.25	1,550	276	560	244
2	.25	1,144	284	852	4
3	.25	1,192	256	276	128
4	.19 (approx.)	956	284	956	284

In searching for yield plots in the mixed conifer type, second growth stands, we found an unusually rapid growing tree even for California. The tree which we nominate to the Hall of Fame is a sugar pine, 63 years old, D.B.H. 38.8 inches, 120 feet total height.

Wieslander in cooperation with Dunston of the Office of Forest Management, visited the principal forests where timber sales are active for the purpose of checking present field inventories being made on cut-over lands. On each forest visited cut-over areas were cruised with the technical assistants of the forests. As a result of this survey a revision of the cut-over timber inventory will be made this winter. This data is not only essential in the preparation and current revision of management plans but will also furnish, on a broad scale, a real check of our silvicultural systems.

Cover Type Map

At the present rate of progress the cover type map for the entire Sierra Range will be completed this year. Cooperation was furnished by the State Forester, the superintendents of the National Parks, and the Forest Supervisors. The maps for the Sequoia and Lassen National Parks have been completed and the Yosemite map is in the making. Each Park superintendent assigned their technically trained forester to this job. The Southern Pacific Railroad Company and a number of lumber companies furnished their type and stand maps of their holdings for our use in checking the field work.

In the Sequoia Park an interesting and unusual block of a Sequoia-fir mixture was found. About 20 per cent Sequcia gigantea is in mixture with Abies concolor and Abies magnifica. The type had an altitudinal range from 6000 to 8000 feet. An isolated individual Sequoia was found growing at the low elevation of 3000 feet.

Southern California

Considerable work has been done on the Barranca Burn. Twenty permanent ecological plots have been established; a 30-foot dam has been built; weirs and meteorological instruments are now being set out. This forest influence study previously commented on, has now been experted by Bates, Chapline, Munns, Dr. F. E. Clements, A. W. Sampson, county and city engineers of Southern California, and a good many lesser experts.

Lowdermilk has built special equipment to measure rain intensity on special plots near the burn. All there remains now is a good southern California torrential rain to start the study as a real going concern.

General

The Annual Meeting of the Society of American Foresters will be held at San Francisco from December 15 to 21, inclusive. The 15th will be devoted to a conference of delegates from the Forestry School; the 16th and 17th to the meeting proper; and the 18th to 21st to a field trip in the redwood region.

Munger and Kotok, as members of the Program Committee, have been wrestling with the preparation of something that will draw out the profession both physically and mentally.

Last but not least, the Station had the real pleasure of an extended visit from the Chief of Research, and the Chief of Experiment Stations. Our own feeling is that what we need is more frequent and longer visits of the same sort.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

One of the most interesting developments of the month was the marking conference held on the Fremont and on the Malheur National Forest. The former was in cooperation with District 5 and the California Forest Experiment Station and at the latter two

District 4 men were present. In each case Mr. Granger, Mr. Ames and several other administrative officers and Mr. Munger, representing the Experiment Station, were present. Each of those present took turns marking trees on sample strips while the others roundly criticised and asked for a showing of reasons to substantiate the cutting or leaving of every tree. The discussions that followed showed up our lack of specific knowledge as to the behavior and subsequent growth of the trees that might be left and pointed to the needs for research in this field. The suggestions made at these conferences will be a helpful guide to us in prosecuting our methods of cutting yellow pine study now under way.

Another outstanding event of the month was the field meeting of the Advisory Council at Wind River September 26 and 27. A group of about thirteen, including Mr. Clapp and a couple of guests, left Portland in the morning by automobile. At Wind River they were joined by Isaac and Simson of the Station staff and spent the rest of the day and part of the next morning in going over the several experimental plots and study areas convenient of access. A descriptive itinerary of the points to be visited, illustrated by a map, was put in the hands of each person. In the evening a business meeting was held in the Station office building and all housed for the night in our buildings. The trip unquestionably gave the Council a much better picture of our work and seemed to whet their interests in forest research.

Assistant Forester Clapp arrived in this territory September 23 for ten days and, in addition to going up to Wind River, he and Munger had two days in central Oregon with Westveld and Meyer on their yellow pine studies. They also had a day with the Assistant General Manager and Forester of the Shevlin-Hixon Lumber Company, seeing the beginnings of industrial forestry on the lands of that company.

All the field assistants employed during the summer were laid off by the end of the month except Mr. Cannavina at Wind River who will remain until the periodic observations are stopped for the season. We were unfortunate in losing Miss Cecilia Marthaller who has served us very efficiently for two years. Her place has been taken by Miss Otelia Krogness who comes to us after experience both in the Forest Service and the Veterans Bureau.

Four more permanent yield plots were laid out in pure second growth Douglas fir during September by Meyer bringing the sum total of such growth plots up to twenty-six, not counting several thinning plots in very young stands. The establishment of these plots ended the work on Douglas fir yields for the summer. Meyer then joined Westveld in the western yellow pine region in order to become acquainted with that region so that

future mensuration studies here may be planned to advantage. The methods of attacking growth and yield problems must be radically different in pine from that in fir; the great abundance of even-aged, immature stands with which the fir region is blessed is not at all duplicated in the pine region.

McArdle spent practically his entire time on the Douglas fir slash study, completing the field work and revising the working plan for collecting the data. He continued the establishment of plots on the Polson sale on the Olympic National Forest as this is typical of the conditions to be encountered in the "fog belt" along the coast. These plots were the last to be established this season, a total of 24 permanent plots having been put in during the summer in periods between fire fighting and fire studying. McArdle left Portland on September 12 for Ann Arbor, where he will devote the academic year to studies bearing on forest fire research in a fellowship at the University of Michigan.

Isaac devoted the first part of the month to putting seed catchers in shape for this year's seed-fall. Additional catchers were constructed and placed in the green timber in order to get a measure of the seed-fall in the undisturbed forest as compared with the outer fringe or lone seed trees. Following this, the northern circuit of reproduction plots was given the final examination. The latter part of the month was spent on the various reproduction studies in the Wind River Valley.

Simson was on annual leave for about half the month but returned in time to make preparation for the Advisory Council meeting and to continue the current fire studies and meteorological studies which field assistant Cannavina carried on during his absence. Simson observed an interesting atmospheric phenomena during the big fire at Wind River -- a thunder storm that developed in a towering smoke column directly overhead from which more than two dozen peals of thunder were heard.

Westveld at the request of the Office of Forest Management went over a proposed sale area on the Deschutes National Forest with members of that Forest force to draw up a plan of slash disposal best suited to that area. It was agreed that on this particular tract a system of partial disposal on strips and intense protection of the remainder for several years after logging would be practical, wise and safe. If this plan is adopted, it will mean a saving to the Government of seven or eight thousand dollars (about what the slash disposal has cost to date) and at the same time, in our opinion, leave the area in better silvicultural condition and reasonably safe from disastrous fire.

Mr. Lyle F. Watts of the D-4 Office of Forest Management spent a few days in central Oregon with Westveld to see logging and slash disposal in that region and to learn our technic in the Methods of Cutting study.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

During September a novel experiment was inaugurated to determine the possibility of stored seed surviving different types of fire. Four brush piles and one small area covered with broadcast slash were burned. With the new Hoskins pyrometer, precise temperature measurements were taken on the surface of the duff, between the duff and the humus, and between the humus and the mineral soil. Samples of each of the important fuels were collected and are now being dried to determine their moisture contents. Wind velocity and relative humidity were measured at half-hour intervals. Although these five tests form only the barest beginning, they have already given us new ideas of the thermal conditions which seeds must experience under brush piles and broadcast burns. Even with the damp fuel conditions prevailing, maximum temperatures varying from 532 to 610 degrees centigrade were attained on the upper surface of the duff under brush piles, while on the lower surface the temperature ranged from 300 to 466 degrees. When it is further considered that the duff remained above 100 degrees centigrade for from 5 to 17 hours, it will be obvious that no seeds could possibly survive such intense and protracted heat.

The last eight days of the month found the entire permanent staff of the Station in a wet camp on Granite Creek, engaged in the autumnal examination of the reproduction plots established this summer by Marshall and his crew in a 1926 burn. In addition, the tree descriptions which could not be completed earlier were finished at this time. It was found that the reproduction showed a very low mortality, due no doubt to the wet summer. Most of the late summer germination was hemlock, cedar, and spruce, with practically no white pine.

Kempff returned to his position on the Station staff about the middle of September, after 11½ months leave without pay, which was granted to permit him to study under Professor Fisher at the Harvard Forest. As a result of his work there Kempff received the MF degree.

To balance Kempff's return, Haig left for an eight months leave of absence in order that he might pursue studies at Yale.

All four field assistants left us during the middle part of the month. We were sorry to lose them since they were undoubtedly the most capable group of assistants we have ever had. Larsen returned to his teaching at Ames, Koch has joined Wyman on the turpentine studies at Starke, while Hatch and Averill are pursuing their undergraduate work at Idaho and Montana.

Early in September Dr. Yrjo Ilvessalo of the research branch of the Finnish Forest Service visited the Station for two days. His chief interest seemed to be in plant indicators of site, although he was much impressed both by our beautiful stands of virgin white pine and our scrubby stands of lodgepole.

A group of visitors consisting of the five members of the Idaho State Board of Forestry stopped at the Station for a short inspection of some of the thinning plots. The Borggreve system of thinning especially interested these men because of the possibility of applying this method to the numerous young stands of white pine in this region and so obtaining a larger financial return earlier than might otherwise be done. Within the past year, State Forester Ben F. Bush has shown a very active interest in the work at the Experiment Station and has brought several influential men here for brief visits.

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ROCKY MOUNTAIN FOREST EXPERIMENT STATION

Considerable time was spent during the month on the management of the station forest. This consisted in completing cutting and removing logs and poles from the two 1-acre plots marked last year in a sapling Douglas fir stand, and in remeasuring the first group of three plots cut over under the present plan. A surprising diameter increase in the trees left on the area is evident, but net increment probably will be nil, due to heavy windfall in the winter and spring following cutting. This condition is not believed to be typical of Douglas fir in this region, and is due to the location of the plots on the brow of an open wind-swept ridge with very shallow soil over the residual granite as indicated by the root development of uprooted trees.

Advantage was taken of the exceptionally heavy western yellow pine seed year to collect cones from some twenty trees selected because of outstanding desirable or undesirable qualities, whose hereditability we wish to determine. Included in

this collection are some cones resulting from artificial crossing of desirable (Strain A) western yellow pine stock, and it is hoped that enough seed will be obtained to give us a start toward developing a pure strain of P. ponderosa, which will show immunity to our ever-prevalent mistletoe.

The first measurement of the 1924 yellow pine plantation representing 39 vigor classes as governed by arbitrarily-established height and crown development groups from the Colorado, Cochetopa and Harney Forests was undertaken. The stock, in general, has shown poor development to date, but this is to a great extent to be blamed to cropping and cutting off of the terminal shoot and bud by browsing deer, perhaps, and also to rabbits. Gophers are also responsible for some loss by cutting the young trees off under the ground. Survival in this plantation last spring was 81.3% of the trees present in the fall, and not including the trees thus lost, most of which were actually destroyed, 22.2% of the surviving stock showed browsing and cutting damage. Height measurements, where the biotic factor is of such consequence, may give us more of a clew to recuperative power than to actual growth ability.

A rather detailed examination was made of Douglas fir and western yellow pine transplant and seedling stock in the nursery from specially selected mother trees, and one lot of 2-2 stock, which has to date indicated a decidedly better development of progeny from a desirable Douglas fir seed-tree over that from an out and out undesirable tree, will be ready for transplanting in the spring.

October Plans

In order to keep in line with the management plan, two more 1-acre plots in Block C must be marked for cutting, tagged and measured. Some improvement work, besides hauling in winter supplies, will have to be done. Following Mr. Munns' visit about the middle of the month, Roeser will make a trip to Jarre Canyon on the Pike to remeasure the three thinning and one check plot in sapling Douglas fir (Christmas tree) stands. If the weather permits eight reproduction quadrats will also be established.

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MANUSCRIPTS RECEIVED

NORTHEASTERN

Form-Class Taper Curves and Volume Tables and Their Application. C. Edw. Behre. (Galley proof).

SOUTHERN

Timber Growing and Logging and Turpentining Practices in the Southern Pine Region. R. D. Forbes (Dept. Bul.)

Effect of Burning and Cattle Grazing on the Survival of Long-leaf Pine Seedlings. E. W. Hadley. (For J.A.R.)

Producing Pine Nursery Stock in the South. P. C. Wakeley. (For 1927 Yearbook)

Planting Southern Pines. P. C. Wakeley. (For 1927 Yearbook)

Thinnings in Second-Growth Southern Pines. L.I. Barrett. (For 1927 Yearbook)

Chemical Weed Control at the Savenac Forest Nursery, Western Mont. W. G. Wahlenberg. (For 1927 Yearbook)

LAKE STATES

Forest Fires in Minnesota. J. A. Mitchell. (1927 Yearbook)

Worn-out Fields are Best Suited for Forest Planting. J. Kittredge, Jr., (1927 Yearbook)

Improving Timber Growth in Northern Swamps. R. Zon. (1927 Yearbook)

New Logging Methods for Old. R. Zon. (1927 Yearbook)

Selective Logging in Northern Hardwoods of the Lake States. R. Zon and R. D. Garver. (To be published by the Northern Hemlock and Hardwood Mfg. Assn.)

APPALACHIAN

Southern White Cedar Timber a Source of Profit. C. F. Korstian. (For 1927 Yearbook)

Chestnut Killed by Blight Being Replaced by other Valuable Timber Trees. C. F. Korstian. (For 1927 Yearbook)

NORTHERN ROCKY MOUNTAIN

The Importance of Lightning as a Cause of Forest Fires. H. T. Gisborne. (For 1927 Yearbook).

IN PRINT

Hanzlik, E. J. Pacific coast hardwoods. (Four L Lumber News, August, 1927.)

Reineke, L. H. The Use of Planimeters in Forest Mensuration. (Note, Journal of Forestry, October, 1927.)

Averell, J. L. The Swedish "Better Sires" Campaign of 1904. (Note in Jour. of For. Oct. 1927.)

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OFFICE OF FOREST PRODUCTS - District One

Mr. Fullaway Leaves the Service.

Mr. S. V. Fullaway, Jr., Chief of the Office of Forest Products, District 1, has left the Service, his resignation becoming effective October 1. He joins the staff of the National Lumber Manufacturers Association and will be the district manager in charge of the Portland, Oregon, office during the country-wide trade extension campaign.

Mr. Fullaway, a graduate of Nebraska University, came into District One of the Forest Service in 1913. After the usual experience of a Forest assistant in those days, on timber reconnaissance and on a number of Forests, he was assigned to the District Office (Office of Management) from 1915 to 1918, when he went to the Nezperce Forest as Supervisor. In 1921 he returned to Missoula to take charge of the Forest Products Office which had been definitely set apart from the Office of Management. During the years 1921 to date he continued as Chief of this office, adding much to its permanency, scope, and usefulness.

Mr. Fullaway's knowledge and experience particularly fit him for successful achievement in his new line of work.

Sawmill Studies

The first and second installments of the article "Size of Timber and Amount of Defect - Important Factors in Lumbering," by Bradner and Fullaway, were completed during the month and sent to The Timberman for publication. The first part should appear in the October issue of The Timberman and the article completed with the December number. The first two installments include twelve tables showing the effect of size upon the value and production costs for sound logs and sound trees of five Inland Empire species, and the application of the sound-tree data to two specific stands. Western white pine, western yellow pine, western larch, Douglas fir, and white fir were the five species studied. The third part of the article, dealing with the effect of defect upon value and costs in logs of the same five species will be completed early in October. This will appear as the third installment in the December issue of The Timberman.

Reprints of the two articles, "Sawmill Efficiency Not Measured by Volume of Production," and "Utilization in the Sawmill," by Bradner, which appeared in The Timberman during the summer have been received and are being distributed.

The Idaho Forest and Timber Handbook

One thousand copies of the Idaho Handook were received from the publisher and the bulk of them distributed during September. The Handbook was published by the School of Forestry of the University of Idaho in co-operation with the Forest Service. R. N. Cunningham, S. V. Fullaway, and C. N. Whitney, of the District One Office, are among the co-authors.

Lumber Prices and Movement

Prices	Annual 1926	First Q. 1927	Second Q. 1927	July, 1927	Sept., 1927
Idaho White Pine	$ 37.77	$ 38.48	$ 38.41	$ 37.62	$ 37.76
Pondosa Pine	26.33	26.28	26.72	25.21	25.71
D. Fir and Larch	17.78	17.62	18.92	18.47	18.87
White Fir	19.10	16.46	18.02	18.26	19.34
Spruce	23.73	23.77	24.09	22.81	23.34

	September, 1926.	September, 1927.
Cut	177,582	160,174
Shipments	189,496	142,635

Mr. Hunt Visits the District

Mr. Geo. M. Hunt of the Forest Products Laboratory, in company with Mr. C. N. Whitney of this office, is making an extended inspection trip throughout the District. A large number of the wood-preserving plants, Service test tracks, pole and post lines are being visited and inspected. Appointments are being made to discuss with Forest Supervisors, company officials, and individuals particularly interested in treating work, their special methods and problems. Mr. Whitney joined Mr. Hunt at Miles City, September 19.

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OFFICE OF FOREST PRODUCTS - District Five

Marine Piling

Final proof and publication work occupied a considerable share of Mr. Hill's time during this period.

Moisture Content

The regional report for California from the Laboratory was sent out to the cooperators and Pine Association. At the Laboratory's request data were collected and worked up in respect to moisture content of California species in summer.

Redwood Project (Laboratory)

Considerable time was given in assisting Mr. Leopold in working out the Laboratory program and in starting the collection of specific gravity samples.

Mill Scale Studies

On August 6 Mr. Brundage returned from his detail to the mill scale study work of D-1 on fire-killed western white pine. After his return, he took up the correlation and preparation of information available from previous studies respecting the deterioration of fire-killed western yellow pine for its application to salvage operations in this species now under way on the Klamath Forest.

Heptane

This project has made excellent progress and extremely interesting information has been obtained.. Mr. Tihomiroff finds by experimental distillation that regardless of intergrading botanical characters, no tree that yields heptane contains any terpenes, and vice versa. He also finds that in Jeffrey pine the distillation of material extracted from the bark and foliage contains terpenes but no heptane. This seems to indicate that the cambium produces on the wood side cells which produce heptane only, and on the bark side cells which produce terpene only.

On August 21 Mr. Hill met Dr. Gerry from the Forest Products Laboratory at Reno, and took her to the heptane area where she went over the work and made many profitable suggestions. On arrival of Dr. Gerry at the San Francisco Office, a conference was held with Vice-President Seaton of the California Chemical Corporation, in which Dr. Gerry was able to offer material help with respect to matters under consideration by the corporation bearing upon the continuance of their work another year.

Project L-177

Following a request from one of the cooperators in this ancient project on the use of tan oak and eucalyptus for insulator pins, cross-arms and cooperage, which was conducted by this office under C. Stowell Smith from 1909 to 1913, it was found that apparently no final report had ever been issued, Mr. Hill spent some time in digesting the progress reports and other records and prepared and sent to the cooperators a summary report.

Fungimors Treatments for Blue Stain and Brown Stain

The Sugar Pine Lumber Company, Pinedale, California, has started experiments on the treatment of lumber with Fungimors to prevent blue stain. At the request of Dr. Cooley this office collaborated in the experiments. The results have not yet accrued in the air-seasoned stock. A preliminary treatment, however, was given to material to be kiln dried and has showed an unexpected and rather extraordinary effect in preventing kiln brown stain, considering that this brown stain is supposed to be a chemical stain and not due to living organisms. A report has been prepared by Mr. Brundage on these experiments for transmittal to the collaborator and the Forest Products Laboratory.

Project L-262

At the request of the Laboratory a supply of petroleum thinner meeting their specification was obtained from the Standard Oil Company of California and forwarded to the Laboratory. Arrangements were also made with W. P. Fuller & Company to have additional posts erected for an extension of the paint test fence for testing the effect of these petroleum thinners.

Lumber Census

A preliminary statement covering California production in 1926 was submitted for approval by the Census Bureau, and has been issued.

Administration

Considerable time has been spent by Mr. Hill with Director Kotok of the California Forest Experiment Station in preparing ma-

terial for and giving other assistance to the Director of the Conservation Department of the California Development Association which has undertaken a campaign on behalf of the McSweeney Bill.

Mr. Hill and Mr. Leopold attended the sessions of the Directors of the National Lumber Manufacturers Association and accompanied the association on their trip to the woods and sawmill operations of California lumber companies.

Mr. Clapp spent considerable time in the District during the first half of September and went over the status of the District Products work with Mr. Hill.

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OFFICE OF FOREST PRODUCTS - District Six

General Woods Waste Survey in the Douglas Fir Region

Hodgson spent the first half of the month in the Grays Harbor and Coos Bay regions, familiarizing himself with the logging waste conditions of those regions in general. He spent the remainder of the month on the final report of this study.

Johnson and Spelman spent the first half of the month in the Grays Harbor region making a survey at two logging camps - the Nemah River Logging Company and the Sunset Timber Company. Johnson reports that less woods waste was found on the operations of these two companies than any of the 13 companies studied this summer; the timber in both cases was mostly large old-growth Douglas fir, with some western red cedar and western hemlock intermixed. The bulk of the waste found consisted for the most part of small hemlock suitable for pulp wood.

Johnson and Spelman spent about a week working up field notes bringing the work of this past summer of the study to completion.

The major part of the field work, including a survey of 24 logging camps, is completed. From now on the work will consist mostly of the preparation of a final report, with the work in all cases falling to Mr. Hodgson as the project leader.

Kiln-dried Douglas Fir Degrade Study

At the request of the Oregon-American Lumber Company, the District Forester entered into a cooperative agreement whereby

assistance is being extended by Products in the making of a degrade study on kiln-dried Douglas fir at the company's plant at Vernonia. Johnson is representing the Office, with the West Coast Lumbermen's Association cooperating to the extent of furnishing their head grader. The work started on September 22.

The test is being made on one and two-inch Douglas fir Common and one-inch flat-grained Douglas fir Finish. Two kiln runs will be made on each grade and size of stock.

Mr. Knauss, formerly with the Forest Products Laboratory and now kiln-drying superintendent at Vernonia, has worked out a much milder schedule for Douglas fir Common than has heretofore been used, and it is the determination of the degrade with the new schedule that prompted the study.

Felling and Bucking Study in the Douglas Fir Region

Spelman spent a very limited amount of time on this study during the month.

Moisture Content Survey, Proj. L-252-5

Gibbons compiled information, also prepared a memorandum, dealing with the moisture content of lumber as shipped in the Douglas fir region for submission to the Forest Products Laboratory.

New Quarters

On the last day of the month Products moved into new quarters; same building and same floor, but somewhat more space and much better general layout. In the move we necessarily did some housecleaning, and possibly threw off some of the things that are supposed to make Government workers different from other people. Products is much pleased.

Publications

Part I of Hodgson's article "Logging Equipment Designed to Reduce Woods Waste" was published in the August number of "Pacific Pulp and Paper Industry" under the editor's title of "Going after that Forty per Cent." The article describes the light machinery now being used with success in re-logging operations in the Douglas fir region. Part II will appear in the October issue.

"American Forests and Forest Life," for September, published an article by Hodgson entitled "The Whimsical Root Habits of Western Hemlock."

One thousand reprints of Gibbons' report, "The Forests and the Wood-using Industries of Washington," were received from the West Coast Lumberman toward the close of the month. The bulk of the reprints are being sent to trade associations, lumber extension bureaus, state foresters, chambers of commerce, industrial committees, educational institutions, libraries, influential members of the state grange, bankers, legislators, and the like, rather than to the wood-using industries themselves. Companies that hold large bodies of timber are being given preference over those that purchase their raw material.

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RANGE RESEARCH

WASHINGTON

Mr. Chapline writes that, from September 12 to 19, he went over with Messrs. Cooperrider and Copple the range management project in the sawtimber type on the Coconino, and has submitted, under date of September 19, a detailed file report on his inspection of this project. He feels that the Pollock sheep allotment and the C. O. Bar cattle range, which Mr. Cooperrider selected, are very satisfactory for the main parts of this study.

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Forage Investigations

Routine Plant Work

Ten plant collections, representing 262 specimens, were forwarded to the Bureau of Plant Industry during the month. No collections were returned from the Bureau of Plant Industry and none have been reported on to the field. The absence of Dr. Blake and Mr. Freeman from Washington, as well as continued work on his Arizona Flora and determinations of Dr. Kearney's extensive Arizona collections, has taken Mr. Tidestrom's time away considerably from Forest Service determinations during the month. Apparently the chief cause, however, for delay in reporting on specimens in the field has been the absence in Europe of Dr. Coville's clerk, Miss McClure, and the fact that, although she is now returned, she has broken her wrist. Mr. Tidestrom reports that he has identified many packages of National Forest material and, as Miss McClure is now "on the job" again, it is believed that a stream of determined material will soon be setting in from Dr. Coville's to this office. 313 plant specimens were mounted during the month.

Miss Hayes Reports

Miss Doris W. Hayes, of Lincoln, Nebraska, reported for duty as the new Junior Plant Ecologist on September 15. Her chief attention has thus far been paid to getting over to the Bureau of Plant Industry as rapidly as possible the plant material that has come in from the field the past summer. Miss Hayes has had a very fine training and is taking hold of the work in excellent shape.

Publications

Dayton has continued during the month the conferences with Dr. Coville over the browse bulletin. These are time consuming, as Dr. Coville goes into considerable detail, but it is believed that they are worth while; that we are gradually getting somewhere, and that eventually some standards or precedents may be set up for this type of bulletin. Considerable time has also been spent in revising the glossary. Two short botanical papers were published in the Proceedings of the Biological Society of Washington for September 26. In the Service Bulletin for September 19 appeared, in somewhat revised form, the rather extensive account of our cooperators in systematic botany prepared about three years ago at Mr. Barnes' request.

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DISTRICT SIX

The first half of September was spent by Mr. Ingram on minor studies work, a week each being spent on the Mt. Hood and Ochoco Forests. On the former in checking up the "Seasons of Grazing" minor project and assisting the rangers in selecting suitable areas for plot study and recording the data found. On the Ochoco with Mr. Fugate of the Biological Survey areas were selected for study of plant succession in the Derr Meadows area following gopher control work.

Final check of forage utilization in the grazing management of cutover lands on the Columbia was also made.

Through the medium of the rubber stamp a simple method has been devised by Grazing Examiner Renner on the Wenatchee Forest, for keeping track of distribution and use being made of plant material collected on the forest. The following rubber stamp is used:-

> "Duplicate of this plant with economic notes has been deposited in herbaria on the following Ranger Districts:
> Cashmere.....Chiwaukum.....Easton.....Entiat.....
> Lake Wenatchee.....Leavenworth.....Liberty....."

This is stamped on the mount of the specimen on file in the Supervisor's office and as extra material becomes available it is distributed on to the field. The District is check-marked on the Supervisor's specimen as material is distributed.

Mr. David D. Keck of the Department of Ecology, Carnegie Institution of Washington, D. C., with headquarters at Berkeley, California, was a recent visitor in the Portland Office.

Mr. Keck reports that one of the studies being made by his department, is the behavior of certain native plants under different soil, altiude, and climatic conditions generally. Their object is to ascertain fixity of character in the determination of species.

Working especially with Pentstemons, cuttings of Northwestern species are obtained and planted in desert alpine and seashore localities. Mr. Keck spent the morning looking over the D-6 herbarium material, and since he was desirous of procuring living plants, directions were given for reaching several localities near Portland where he could secure suitable material for this work.

Mr. Keck has promised to report the Oregon species used and the ultimate success in this work.

Dr. Eggleston (poisonous plant investigator) of the Bureau of Plant Industry also paid the District Office a flying visit early in the month. He left for a two weeks trip into the Mt. Baker (Washington) region with Prof. Harold St. John of Washington Agricultural College and a party of students. Dr. Eggleston was "after" ripe fruit of Rhamnus purshiana of which he secured a quantity in the Mt. Baker section. He is planning on a trip through the Blue Mountains in 1927.

During his visit the D-6 grazing office was a rendezvous for botanists, Dr. Hitchcock, Agrostologist for the Bureau of Plant Industry, also being here. A conference between these men and Prof. Peck of Willamette University and Mr. Thompson, his assistant, was arranged and discussion of the relative merits of plant systematists and plant ecologists ensued. In the absence of the latter the systematists got distinctly the best of it. My own rather meek protest in defense of the ecologist was promptly steam-rollered.

Mainly the discussion centered around Prof. Peck's forthcoming Flora of Oregon. While the need for such a work has partly been met by Vol. I, Abrams' Flora of Pacific Coast, all agreed in the need for an up-to-date Flora of the State covering the entire field. Many suggestions were made, one of which was the issuance of a more local Flora, for the Willamette Valley specifically.

Eggleston and Hitchcock both volunteered to give Prof. Peck any assistance possible. Drs. Henderson and Sweetzer of the University of Oregon, it is understood, have also volunteered to help.

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Range Conditions and Precipitation

The Reserve has been favored with a continuation of the general rains which started in the last week of July; the different stations varying between two and three inches to date this month. This has insured the production of an excellent forage crop in spite of the growing season being deferred until July 25. The forage is in good condition and there will be ample feed to carry the cattle over the winter in fine shape. It seems that the short, but quick growing season, has produced summer forage which is much more palatable than did last year's long, drawn-out season.

The breeding herd is in excellent condition, and calves are good enough to bring a good price in sales which will be made soon. The cows which were moved on to the Reserve from the dry Van Horn, Texas, area last month are now in good shape, while their calves are nearly as big and fat as those raised on the Reserve.

Several cases of worms in the fresh brands have kept the cowboys riding all month. So far, no losses from this cause have been reported.

Investigative Work

A large part of the month was spent in charting quadrats. A three-man crew, using the Hill Pantograph, charted ninety quadrats in ten days. This work is now practically complete, except for twenty quadrats, the charting of which must be deferred until the clipping studies are concluded for the season.

In connection with the clipping studies, Campbell and Canfield have developed an improved set of shears which facilitate the work considerably. The loss of leaves and short tips of grass is avoided by the presence of copper strips an inch high, soldered onto the outer edges of the blades. Another advantage of this tool is an adjustable gage set on the side of one blade, whereby the necessity of continually measuring the grass is avoided. The gage is simply set at the desired height and the clipping is begun.

A number of plant specimens, including the principal grasses and weeds which are indicators of overgrazing, were forwarded to the Washington Office for the preparation of an exhibit for the International Livestock Exposition at Chicago.

Visitors

Dr. R. R. Staples and his wife, and Dr. A. E. Romyn, of the Department of Agriculture, Union, South Africa, were visitors on September 9 and 10. The vegetative projects were all visited and discussed, and carrying capacity and management plans were gone over in the office. A visit to nearby outside range was made to show the advantages of the conservative stocking policy which is followed on the Reserve.

Doctor Staples thought the Reserve and surrounding country presented conditions more similar to the central part of the Union than any he had visited.

Mr. Campbell went with the party to El Paso, where they were able to meet Director Schoeller on his return from Washington.

Personnel

Frank Brown, summer assistant during the quadratting season, quit work on the sixth to take up work in the Las Cruces High School.

Director Schoeller returned to the Jornada from his Washington detail on the 11th, with his carrying capacity manuscript nearing completion.

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THE EDITOR

Tables of Contents

A table of contents is much more than the name implies, at least to the editor who takes up a new manuscript and sits him down, with perhaps a sigh or two, to become acquainted with another Ancient Mariner.

It is astonishing how much light can be thrown upon the thought processes of the author by a careful study of the table of contents. Nearly every literary deformity that may be found in a manuscript will betray itself in some way or other in the contents. Any author to whom the editorial thunderbolts are a mystery, inexplicable, unforeseeable, and inescapable, is advised to make a serious effort to see the table of contents of his manuscript objectively, to scrutinize it as an entity apart from all the time and labor, the work and worry that he has put in upon his report. If he is successful in doing this, he will find that he can foresee much of what the editors will try to do with his manuscript.

He will find that the obscurities of his style are reflected in subheadings that do not explain themselves when apart from their text. If he has been repetitious in his text, that quality will be evident in the way in which the same minor subheadings recur under different main headings, or subheadings differently worded imply more or less the same content. If, perhaps without intending to do so, he has attacked his subject languidly, weakly, narrowly, without the proper focus, or without attempting to preserve the proper balance and relationship between the several features covered by the report, much of this will be evident to any one who studies his table of contents carefully.

For example, here is a manuscript with six main headings and under four of these main headings are one or more subheadings regarding cutting practice. If the author had examined his contents critically, as the editor must, that repetition would have been very obvious to him. What it implies is borne out in the manuscript itself. There is much repetition on this subject and on others, and such subjects are in their treatment so scattered through the manuscript that it is extremely difficult for the reader to coordinate the separate items. This manuscript was revised and in the revision the table of contents carried five main headings, under only one of which occurred subheadings referring to cutting practice.

Where similar features must be discussed with respect to several different types or species, it is often difficult to be sure that this has been done in the most direct and economical manner. The measure of success will generally be indicated by the table of contents. If a careful study of the contents yields no impression of artificiality, tiresome repetition, or unnecessarily detailed statement, it is safe to assume that the text also has avoided these pitfalls.

The best way to get acquainted with a table of contents is, of course, to study first the relationship of the headings. Are all headings of the same weight? Are the main headings many or few? How many orders or grades of headings are there? By reading consecutively the main headings only can the reader get a good understanding of what the publication is about? Do these main headings deal with topics of equal importance? Considering each main heading separately, do the secondary headings all relate to the main heading? Do some of them appear to be more closely related to some other main heading? Are some of them virtually tertiary headings which should be subordinated to one of the secondary headings? Do the headings of the fourth and fifth grades represent important distinctions?

Here, for example, are four main headings, two of them merely introductory, the third covering the whole of the report except for certain material somewhat in the nature of an appendix which is covered by the fourth heading. This third heading has under it four secondary headings, all indicating major portions of the report. The indication here is not so much that anything is wrong with the text as that the third main heading is probably unnecessary and that its four secondary headings should be advanced to the class of main headings. That is, the relationship

A, B, C, 1, 2, 3, 4, D

is not very well balanced. A better relationship is

A, B, C, D, E, F, G

Here the subheadings 1, 2, 3, 4 have become main headings C, D, E, F, and the original C has been dropped.

Still more is to be gained by an intensive study of the development of the subject, as indicated in the table of contents as a whole. It is seldom indeed that the good or bad indications furnished by the order of headings are not symptoms of similar qualities in the text. A study of the table of contents of the completed manuscript offers the author an opportunity to edit his own work, an opportunity which any editor will eagerly urge him to seize and exploit to the utmost.

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